IN THE CLAIMS

Claims 20-22 are canceled. No other amendment is made to the claims.

1. (Previously Presented) An implantable system, comprising:

a plurality of sensors configured to detect heart sounds and to generate a plurality of sensed signals representative of the heart sounds;

an interface circuit for communicating with an external system; and

a control circuit, coupled to the plurality of sensors and the interface circuit, configured to receive the plurality of sensed signals, to generate data representative of the heart sounds, and to transmit the data to the external system via the interface circuit,

wherein the control circuit provides for a first processing path including a first band-pass filter, a rectifier, a low-pass filter, and a first ensemble averager to process the plurality of sensed signals for machine detection of the heart sounds and a second processing path including a second band-pass filter and a second ensemble averager to process the plurality of sensed signals for visual display of the heart sounds,

wherein the plurality of sensors, interface circuit and control circuit are implantable.

2. (Previously Presented) The system of claim 1, wherein the plurality of sensors include an accelerometer.

3. (Previously Presented) The system of claim 1, further comprising an implantable housing for the control circuit, wherein at least one of the plurality of sensors is located internal to the implantable housing.

4. (Previously Presented) The system of claim 1, further comprising an implantable housing for the control circuit, wherein at least one of the plurality of sensors is located external to the implantable housing.

5. (Original) The system of claim 1, wherein the interface circuit is configured to communicate with the external system using radio-frequency (RF) signals.

6. (Original) The system of claim 1, wherein the interface circuit is configured to communicate with the external system using optical signals.

7. (Original) The system of claim 1, wherein the data transmitted by the control circuit to the external system includes raw data determined by digitizing the sensed signals.

8. (Original) The system of claim 1, wherein the data transmitted by the control circuit to the external system includes processed data from processing the sensed signals.

9. (Previously Presented) A system, comprising:

an implantable device including:

a first sensor for detecting heart sounds and for generating first sensed signals representative of the heart sounds;

a second sensor for detecting cardiac electrical signals and for generating second sensed signals representative of the cardiac electrical signals;

a first interface circuit; and

a first control circuit that includes a bandpass filter and an ensemble averager, coupled to the sensors and the interface circuit, configured to receive the first and second sensed signals, to generate first data representative of the heart sounds from the first sensed signals by filtering and averaging the signals, to generate second data representative of the cardiac electrical signals from the second sensed signals, and to transmit the first data and the second data via the first interface circuit; and

an external device communicatively coupled to the implantable device, the external device including:

a second interface circuit;

an output device including a display configured to simultaneously display multiple signals; and

a second control circuit, coupled to the second interface circuit and the output device, configured to receive the first data and the second data via the interface

circuit, detect predetermined type heart sounds from the first data and predetermined type electrical cardiac events from the second data, calculate at least one timing difference between an electrical cardiac event of the predetermined type electrical cardiac events and a heart sound of the predetermined type heart sounds, and generate control signals causing the output device to simultaneously output at least the first sensed signals, the second sensed signals, and the at least one timing difference.

10. (Original) The system of claim 9, wherein the first sensor includes an accelerometer.

11. (Previously Presented) The system of claim 9, wherein the implantable device comprises an implantable housing for the control circuit, wherein the first sensor is internal to the implantable housing.

12. (Previously Presented) The system of claim 9, wherein the implantable device comprises an implantable housing for the control circuit, wherein the first sensor is external to the implantable housing.

13. (Original) The system of claim 9, wherein the second sensor includes an EGM sensing electrode and the second sensed signals are representative of EGM electrical signals.

14. (Original) The system of claim 9, wherein the second sensor includes an atrial sensing electrode and the second sensed signals are representative of atrial electrical signals.

15. (Original) The system of claim 9, wherein the second sensor includes a ventricular sensing electrode and the second sensed signals are representative of ventricular electrical signals.

16. (Previously Presented) The system of claim 9, wherein the second sensor is adapted to be disposed in the right side of the heart.

17. (Previously Presented) The system of claim 9, wherein the second sensor is adapted to be disposed in the left side of the heart.

18. (Original) The system of claim 9, wherein the first data transmitted by the control circuit to the external system includes raw data determined by digitizing the first sensed signals.

19. (Original) The system of claim 9, wherein the first data transmitted by the control circuit to the external system includes processed data from processing the first sensed signals.

20-55. (Canceled)

56. (Previously Presented) A method of outputting heart sounds using an implanted system, comprising:

detecting heart sounds using a plurality of first implanted sensors;

generating first data representative of the heart sounds for visual display of the heart sounds using band-pass filtering and ensemble averaging;

transmitting the first data representative of the heart sounds to an external system; and

generating second data representative of the heart sounds for machine detection of the heart sounds using band-pass filtering, rectification, low-pass filtering, and ensemble averaging.

57. (Previously Presented) The method of claim 56, further comprising detecting first cardiac electrical signals using a second implanted sensor, transmitting data representative of the first cardiac electrical signals to the external system, and simultaneously displaying the data representative of the heart sounds and the data representative of the first cardiac electrical signals.

58. (Previously Presented) The method of claim 57, further comprising detecting second cardiac electrical signals using a third implanted sensor, transmitting data representative of the second cardiac electrical signals to the external system, and simultaneously displaying the data representative of the heart sounds, the data representative of the first cardiac electrical signals, and the data representative of the second cardiac electrical signals.

59. (Previously Presented) A method of outputting heart sounds using an implanted system, comprising:

generating first data representative of heart sounds in the implanted system using ensemble averaging;

receiving the first data from the implanted system;

generating control signals using the first data;

generating timing comparison control signals indicative of a timing of the control signals; and

applying the control signals and the timing comparison control signals to an output device to cause the output device to generate outputs which are representative of the heart sounds and timing information related to the heart sounds.

60. (Original) The method of claim 59, further comprising receiving surface ECG data, wherein generating the control signals also includes using the surface ECG data, and applying the control signals to the output device also causes the output device to generate surface ECG outputs which are representative of the surface ECG.

61. (Original) The method of claim 60, further comprising outputting relative timing information between the heart sounds and surface ECG events on the output device.

62. (Original) The method of claim 59, further comprising receiving second data representative of first cardiac electrical signals from the implanted system wherein generating the control signals includes using the second data, and applying the control signals to the output device causes the output device to generate outputs which are representative of the heart sounds and the first cardiac electrical signals.

63. (Original) The method of claim 62, further comprising outputting relative timing information between the heart sounds and the first cardiac electrical signals on the output device.

64. (Original) The method of claim 62, further comprising receiving third data representative of second cardiac electrical signals from the implanted system, wherein generating the control signals includes using the third data, and applying the control signals to the output device causes the output device to generate outputs which are representative of the heart sounds, and the first and second cardiac electrical signals.

65. (Original) The method of claim 64, further comprising outputting relative timing information between the heart sounds, the first cardiac electrical signals, and the second cardiac electrical signals on the output device.

66-72. (Canceled)

73. (Previously Presented) The system of claim 1, wherein the control circuit further includes a systole detector coupled to the ensemble averager wherein detection of systole triggers the ensemble averager.

74. (Previously Presented) The system of claim 1, wherein the control circuit further includes a band pass filter coupled to the sensor and ensemble averager, wherein the output of the band pass filter is applied to the ensemble averager.

75. (Previously Presented) The system of claim 1, wherein the control circuit further includes:

a band pass filter to receive signals from the sensor;

a rectifier coupled to the band pass filter; and

a low pass filter coupled to the rectifier and the ensemble averager.

76. (Previously Presented) The system of claim 59, wherein the averaging includes sequentially averaging a number of completed cardiac cycles over a period of time.

77. (Previously Presented) The system of claim 59, wherein the averaging includes averaging a number of completed cardiac cycles while a patient condition is present.